Medical Aspects of Chemical, Biological, And Radiological Warfare

HM2 IBANEZ

“Gas warfare”

- The use of chemical agents in a gaseous, solid, or liquid state
- 1. Harass personnel
- 2. Produce casualties
- 3. Render areas impassable or untenable
- 4. Contaminate food and water

History

- 1915:
- WWI
- 1. Germans released chlorine gas against the Allied positions in Ypres, Belgium
- 2. Resulted in over 5,000 casualties
- 1/3 of all American casualties in this conflict were due to chemical agents attacks

Dispersal

- Chemical agents are dispersed by modern weapons for strategic and tactical purposes.
- Area of their use are limited by the range of the weapons or aircraft used by the combatant force.

Self-Protection & Treatment

- First PRIORITY in a chemical attack is…

Self-Protection & Treatment

- ..to ensure your OWN SURVIVAL, so you may treat others.

- Besides a mask,
- Use a M291 skin decontamination kit (for chemical agents)
- M291 replaced the M258A1

M291 & M258A1

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Figure 8-1.—M291 skin decontamination kit.

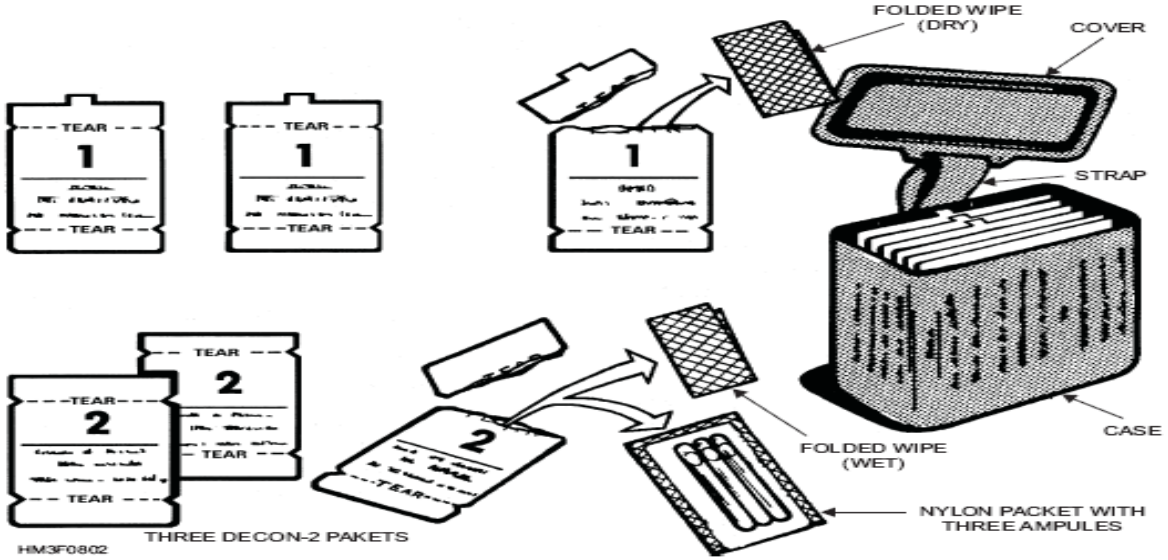

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Figure 8-2.—M258A1 skin decontamination kit.

Decontamination

- Guiding principle in personnel decontamination is:
- 1. AVOID spreading contamination to clean areas
- 2. MANAGE casualties without aggravating other injuries

Casualty Priorities

- Decide whether to handle SURGICAL or CHEMICAL hazards first.
- If situation and condition of casualty permits,
- DECONTAMINATION should be carried out FIRST

It will often be necessary to decide whether to handle the surgical condition or the chemical hazard first. If the situation and the condition of the casualty permit, decontamination should be carried out first. The longer the chemical remains on the body, the more

necessary

6. First aid in less severe shock and wounds

The basic steps in sorting and handling casualties are indicated in figure 8-3. This plan should be modified to fit specific needs.

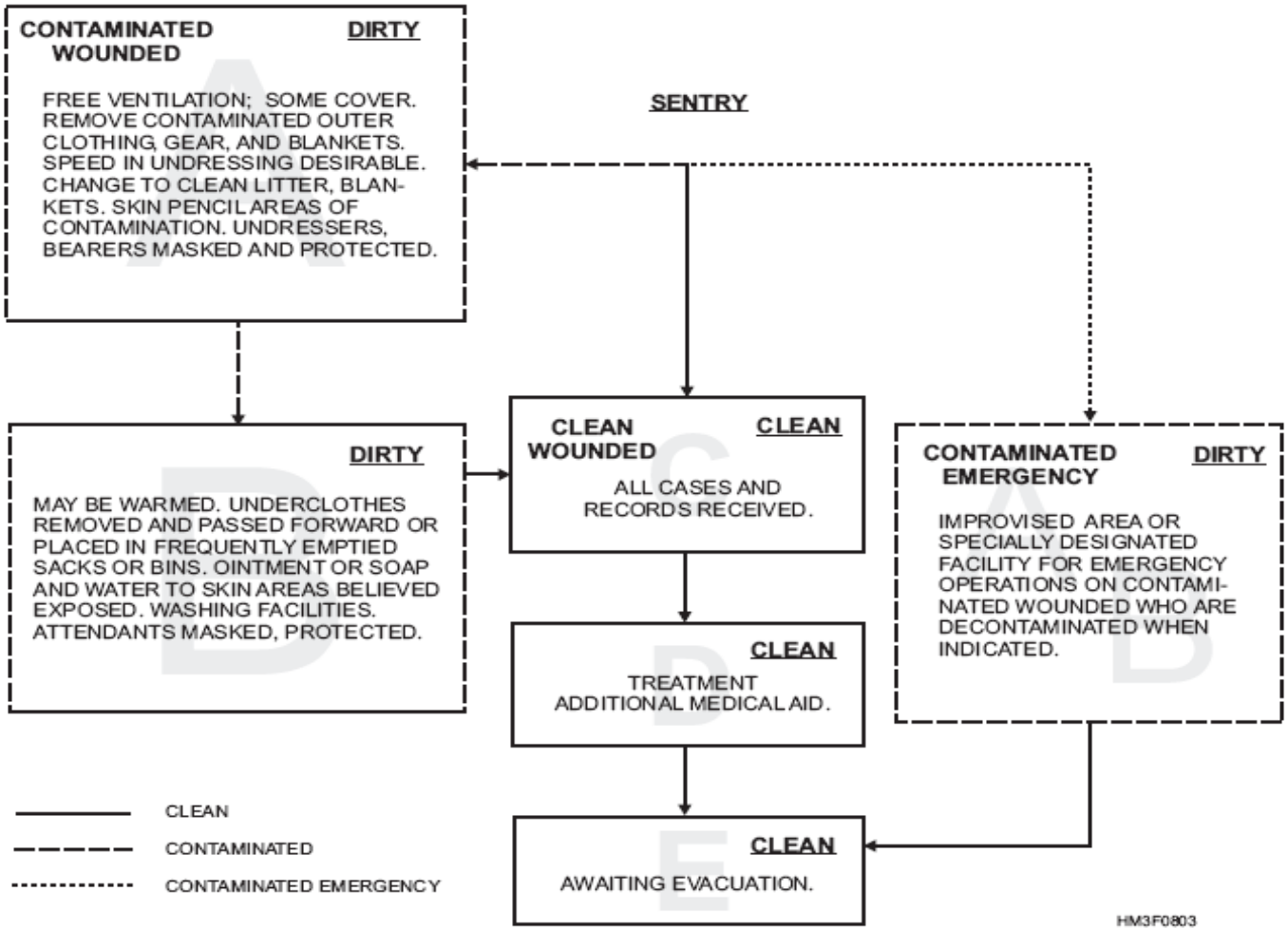
CONTAMINATED WOUNDED
DIRTY
FREE VENTILATION; SOME COVER. REMOVE CONTAMINATED OUTER CLOTHING, GEAR, AND BLANKETS. SPEED IN UNDRESSING DESIRABLE. CHANGE TO CLEAN LITTER, BLANKETS. SKIN PENCIL AREAS OF CONTAMINATION. UNDRESSERS, BEARERS MASKED AND PROTECTED.
SENTRY
DIRTY
MAY BE WARMED. UNDERCLOTHES REMOVED AND PASSED FORWARD OR PLACED IN FREQUENTLY EMPTIED SACKS OR BINS. OINTMENT OR SOAP AND WATER TO SKIN AREAS BELIEVED EXPOSED. WASHING FACILITIES. ATTENDANTS MASKED, PROTECTED.
CLEAN WOUNDED
CLEAN
ALL CASES AND RECORDS RECEIVED.
CLEAN
TREATMENT ADDITIONAL MEDICAL AID.
CONTAMINATED EMERGENCY
DIRTY
IMPROVISED AREA OR SPECIALLY DESIGNATED FACILITY FOR EMERGENCY OPERATIONS ON CONTAMINATED WOUNDED WHO ARE DECONTAMINATED WHEN INDICATED.
CLEAN
AWAITING EVACUATION.
CLEAN
CONTAMINATED
CONTAMINATED EMERGENCY
HM3F0803

Figure 8-3.—Basic steps in sorting and handling casualties.

Basic steps in sorting and handling casualties

Order of Priorities

- 1. Control of massive hemorrhage
- 2. First aid for life threatening shock and wounds
- 3. Decontamination of exposed skin and eyes
- 4. Removal of contaminated clothing and decontamination of body surfaces
- 5. Adjustment of patient’s mask
- 6. First aid in less severe shock and wounds

Decontamination Station Organization

- In general, decontamination stations, or “dirty” area, receives casualties
- Each ship will have a minimum of at least two decontamination stations (as hull design permits)
- “dirty” area should be topside or in a well-ventilated space

Decontamination Station Organization

- In the “dirty” area, casualties will be:
- 1. decontaminated
- 2. undressed
- 3. showered
- 4. passed along to clean area
- Both areas should be clearly marked as either “clean” or “contaminated”

Decontamination Station Organization

- Decontamination kits, protective ointment, and an abundant supply of soap and water must be provided
- First-aid items should also be on hand
- When possible, improvise the use of supports (small boxes, blocks of wood, etc.) to keep stretchers off the deck

Handling of Contaminated Casualties

- Contaminated personnel, clothing, or equipment must be kept out of uncontaminated areas.
- Contaminated clothing and gear must be placed in designated:
- 1. dump areas
- 2. kept in metal cans w/ tightly fitting covers, whenever practically possible

Supplies

- Medical Officer or Senior Medical Department Representative (SMDR) is:
- 1. responsible or maintaining adequate supplies for decontamination and treatment of CBR casualties

Supplies

- Medical decontamination supplies are supplied to ships on a personnel-strength basis, as listed in the current Authorized Medical Allowance List (AMAL)

Supplies

- Decontamination supply cabinets will be kept LOCKED, and the keys will be in custody of the Damage Control Assistant (DCA)
- Cabinets and chests will be stenciled with a RED CROSS and marked “DECONTAMINATION MEDICAL SUPPLIES”

Chemical Agents

- Grouped under several classifications;
- 1. general effect produced
- 2. psychological effects
- 3. lethal or non-lethal
- 4. persistent or non-persistent

General Effect Produced

- 1. Severe casualty
- 2. Harassment
- 3. Incapacitation

Psychological Effect

- A medical point of view

Lethal or non-lethal

- NON-LETHAL agents will not kill you
- LETHAL agents result in a 10% or greater death rate among casualties

Persistent or Non-persistent

- Depends on the length of time they retain their effectiveness after dissemination

Nerve Agents

- Produce their effect by interfering with normal transmission of nerve impulses in the parasympathetic autonomic nervous system
- They are odorless, almost colorless liquids, vary in viscosity and volatility
- Known as Cholinesterase inhibitors

Nerve Agents

1. Tabun (GA)

2. Sarin (GB)

3. Soman (GD)

4. VX

Nerve Agents

- Signs and symptoms.
- If a vapor exposure has occurred:
- the pupils will constrict, usually to a pinpoint.
- If the exposure has been through the skin:
- Local muscular twitching where agent was absorbed.
- Other symptoms will include:
- rhinorrhea, dyspnea, diarrhea and vomiting,
- convulsions, hypersalivation, drowsiness, coma, and
- unconsciousness.

Nerve Agents

- Treatment:
- Atropine – Acetylcholine blocker
- WHEN EXPOSED:
- Issue 2mg of Atropine and three 600mg of 2-PAM CL via auto-injector
- DO NOT GIVE as a preventive measure

Nerve Agents

- For medical personnel:
- Continue administering Atropine until mild atropinization occurs (tachycardia and dry mouth)

Nerve Agents

- Self-aid:

1. Hold your breath, don mask
2. Inject ONE SET of Atropine and 2-PAM CL into lateral thigh muscle or buttocks
3. Hold Atropine for 10 seconds, and do the same with the 2-PAM CL
4. Attach used injectors to your clothing

Nerve Agents

- 5. Wait 10-15 minutes before administering the second set (the time it takes for the antidote to work)
- 6. If symptoms still persist, a third set may be given by non-medical personnel

Nerve Agents

- Buddy Aid:

1. Mark casualty, if necessary
2. In rapid succession, give three sets of nerve agent antidote

IMPORTANT: Use the casualties own auto-injectors when providing aid

Blister Agents

- Also known as Vesicants
- Primary action is on the skin:
- 1. produces large, painful blisters that are capacitating
- 2. Classified as non-lethal, high doses can cause death

Blister Agents

- Mustard (HD) – Has a garlic or horseradish smell
- Nitrogen Mustard (HN) – fishy odor
- Lewisite (L) – geranium or fruity odor
- Phosgene Oxime (CX) – Disagreeable odor

Blister Agents

- S/S of HD and HN:
- The eyes are the most vulnerable part of the body to mustard gas.
- The first noticeable symptoms of mustard exposure will be pain and a
- gritting feeling in the eyes, accompanied by spastic
- blinking of the eyelids and photophobia.
- Vapor or liquid may burn any area of the skin, but the burns will
- be most severe in the warm, sweaty areas of the body:
- the armpits, groin, and on the face and neck.
- Blistering begins in about 12 hours but may be delayed for up to
- 48 hours.
- Inhalation of the gas is followed in a few hours by:
- irritation of the throat, hoarseness, and a
- cough.
- Fever, moist rales, and dyspnea may develop.
- Brochopneumonia is a frequent complication.
- The primary cause of death is massive edema or
- mechanical pulmonary obstruction

Blister Agents

- Treatment:
- No specific treatment
- Remove as much of the mustard poisoning as possible
- Treat symptoms as the occur (relive pain, itching and control infection)

Blister Agent

- Lewisite
- s/s:
- Causes intense pain on the skin during contact
- Respiratory symptoms are similar to those caused by mustard gas

Blister Agent

- Treatment:
- Decontaminate eyes by flushing with COPIOUS amounts of water.
- Use Sodium sulfacetamide, 30% solution, to combat eye infection within the first 24 hours
- Use Morphine, in severe cases

Blister Agent

- Systemic involvement:
- Use British Anti-Lewisite (BAL), dimercaprol (used as an antidote for poisoning caused by lewisite), in a peanut oil suspension for injection
- Binds with heavy metals forming a water-soluble, nontoxic complex that is excreted

Blood Agents

- Interfere with enzyme functions in the body (block oxygen transfer)
- Can cause death in a very short time after exposure
- They are non-persistent

Blood Agents

- Hydrocyanic acid (AC) – bitter almond smell
- Cyanogen Chloride (CK) – irritating odor

Blood Agents

- Vary with concentration and duration of exposure.
- Either death or recovery takes place rapidly.

- After exposure to high concentrations of
- the gas, there is a forceful increase in the depth of
- respiration for a few seconds, violent convulsions after
- 20 to 30 seconds, and respiratory failure with cessation
- of heart action within a few minutes.

Blood Agents

- Treatments
- Two suggested antidotes:
- 1. Amyl Nitrite, in crushed ampules (first aid)
- 2. Sodium thiosulfate, in I.V. solution

Blood Agents

- Treatment:
- In an attack, smell almond, hold breath and don mask
- For victims,
- Crush two ampules, up to 8
- Administer 100-200mg/kg of Sodium thiosulfate, I.V. in a 9 minute period
- SPEED is the key to a successful cyanide therapy

Choking or Lung Agents

- Effects the lungs
- Causes extensive damage to alveolar tissue, resulting in severe pulmonary edema

Choking or Lung Agents

- Phosgene (CG) – colorless gas, new – mown hay or freshly cut grass smell
- Chlorine (CL)

Choking or Lung Agents

- Watering of the eyes, coughing, and a feeling of tightness in the chest.
- No symptoms for 2 to 6 hours after exposure.
- Latent symptoms:
- rapid, shallow, and labored breathing; painful cough; cyanosis; frothy sputum; clammy skin; rapid, feeble pulse; and low blood pressure. Shock may develop, followed by death.

Choking or Lung Agents

- Once symptoms appear:
- Bed rest is MANDATORY
- Keep victims with lung edema, moderately warm, and treat the resulting anoxia with oxygen
- Because no specific treatment for CG poisoning is known, treatment has to
- be symptomatic.

Incapacitating Agents

- Comprised of psychochemicals
- Produce mental confusion and an inability to function intelligently
- They temporarily prevent an individual from carrying out assignments
- Administered through food, water or in the air

Incapacitating Agents

- The standard incapacitant in the U.S. is 3-quinuclidinyl benzilate
- **BZ**
- Produces delirium that last for several days

Incapacitating Agents

- BZ:
- In small doses,
- 1. increased heart rate, pupil size, and skin temperature, drowsiness, dry skin a decrease in alertness
- Large doses,
- Progressive deterioration of mental capability, ending in stupor(shock or daze)

Incapacitating Agents

- Characteristics of the incapacitants:
- · High potency (i.e., an extremely low dose is
- effective) and logistic feasibility
- · Effects produced mainly by altering or
- disrupting the higher regulatory activity of the
- central nervous system
- · Duration of action comprising hours or days,
- rather than momentary or transient action
- · No permanent injury produced

Incapacitating Agents

- The first symptoms appear in 30 minutes to several
- hours and may persist for several days.
- Abnormal, inappropriate behavior may be the only sign of intoxication.
- (Irrational statements and have delusions or hallucinations)
- In some instances, the victim may complain of dizziness, muscular incoordination, dry mouth, and difficulty in swallowing.

Incapacitating Agents

- .The first aid is to prevent victims from injuring themselves and others
- There is no specific therapy for this type intoxication.
- BZ and other agents in the class of compounds known as glycolates:
- Physostigmine is the drug treatment of choice.
- effective during the first 4 hours following exposure;
- very effective as long as treatment is
- continued.
- Treatment does not shorten the duration of BZ intoxication, and premature discontinuation of therapy will result in relapse.

Riot Control/Harassment Agents

- Non-toxic, but produces immediate but temporary effect in very low concentration
- Used to harass enemy personnel or to discourage riot actions
- No therapy required
- Remove from environment is sufficient for recovery

Riot Control/Harassment Agents

- Two classes of Riot-control/harassment agents:
- 1. Lacrimators
- 2. Vomiting Agents

Lacrimators

- Also known as tear gases
- Local irritants that act primarily on the eyes
- In high concentration, can irritate respiratory tract and skin

Lacrimators

- Chloracetophenone (CN)

- Orthochlorobenzilidine malanonitrile (CS):

1. CS is more potent than CN
2. CS is used by the military

Other lacrimators are CR and CA

Lacrimators

- Colorless to white vapor
- Has a pepper-like smell

Lacrimators

- Produce intense pain in the eyes with
- excessive tearing.
- The symptoms following the most
- severe exposure to vapors seldom last over 2 hours.
- After moderate exposure, they last only a few minutes.

Lacrimators

- Exposure to fresh air and letting wind blow into wide open eyes is sufficient for recovery in a short time.
- Any chest discomfort after CS exposure can be relieved by talking.

- An important point to remember:
- material sticks to clothing, and a change
- of clothing may be necessary.
- Do not forget the hair (both head and facial) as a potential source of recontamination.

Vomiting Agents

- Diphenylaminochloroarsine (Adamsite or DM)
- Diphenylchloroarsine (DA)
- Diphenylcyanoarsine (DC)
- Used as training and riot control agents
- Dispersed as aerosols and produce their effects by inhalation or direct eye contact

Vomiting Agents

- Vomiting agents produce a strong pepper-like irritation in the upper respiratory tract, with irritation of the eyes and lacrimation.
- Cause violent uncontrollable sneezing, coughing, nausea, vomiting, and a general feeling of malaise.
- Inhalation causes a burning sensation in the nose and throat, hypersalivation, and rhinorrhea. The sinuses fill rapidly and cause a violent frontal headache.

Vomiting Agents

- mask be worn in spite of coughing, sneezing, salivation, and nausea
- Carry on duties as vigorously as possible

  will help to lessen and shorten the symptoms.

Vomiting Agents

- First aid consists of washing the skin and rinsing the eyes and mouth with water.
- A mild analgesic may be given to relieve headache.
- Recovery is usually spontaneous and complete within 1 to 3 hours.

White Phosphorus

White Phosphorus

- A pale, waxy solid that ignites spontaneously on contact with and gives a hot, dense, white smoke composed of phosphorus pentoxide particles

White Phosphorus

- No treatment is necessary, spontaneous recovery happens once personnel are removed from the WP source

White Phosphorus

- When WP is embed in the skin,
- they must be covered with water, a wet cloth, or mud.
- A freshly mixed 0.5 percent solution of copper sulfate (which produces an airproof black coating of copper phosphide) may be used as a rinse but must not be used as a dressing.
- The phosphorus particles are SURGICALLYremoved

Biological warfare

- The uses of microorganisms as a weapon of war
- Use of antianiaml and antiplant agents to reduce or destroy a nation’s food supply

Biological warfare

- Dispersed in the air and travel downwind
- May be inhaled, unless a protective mask is worn
- Capable of contaminating clothing, equipment, food and water supplies.

Biological warfare

- Cannot be detected by the physical senses or by chemical detectors
- Can be identified by laboratory examination of air samples or contaminated objects

Biological warfare

- Exposure and onset of disease symptoms will usually seen in a matter of days rather than hours

Biological warfare

- Upon notification of an attack with biological
- Agents & before entering an area known to be contaminated the following steps should be taken:
- 1. Put on protective mask and check it for correct
- fit.
- 2. Button clothing. Tie clothing at wrists and
- ankles with string or extra shoelaces. Put on
- special protective clothing, if available.
- 3. Put on gloves, if available.
- 4. While in the contaminated area, maintain the
- provisions outlined above.

Biological warfare

- In biological as well as chemical and radiological warfare, a tightly constructed shelter offers great protection.
- The shelter must be pressurized to prevent entrance of the microorganisms.

Biological warfare

- Food:
- In the event of a known or suspected biological attack, all exposed or unpackaged foods not in critical supply should be destroyed.
- Food can be rendered safe for consumption
- by application of moist-heat cooking procedures, i.e. deep-fat cooking is adequate

Biological warfare

- Water:
- Chlorination is by far the almost universal method of purifying water
- It destroys most of the biological agents
- Boiling may be required to ensure proper decontamination in exceptional cases.

Biological warfare

- For small groups of people:
- Lyster bag is a suitable container for the storage of water that has already been treated.

- NAVMED P-5010 (For detailed water purification procedures)

Biological warfare

- The Medical Department personnel is RESPONSIBLE for the decontamination of the wounded

Radiological warfare

- Alpha and beta particles have very little penetrating power and intact skin forms an adequate barrier
- Gamma radiation has much greater penetrating power and presents the greatest risk of exposure and damage to tissue.

Radiological warfare

- Time , Distance and Shielding are the major elements that guide the actions o exposure

Radiological warfare

- Lead is the most effective shielding material
- Wood, concrete, other metals, and heavy clothing will somewhat reduce the amount of gamma radiation that reaches the body.

Radiological warfare

- In avoiding particle exposure, full personnel-protective clothing and a protective mask with hood provides the best protection.

Radiological warfare

- The eyes may be affected by thermal radiation.
- Thermal blindness may persist for
- 20 to 30 minutes.

Radiological warfare

- Protection and equipment:
- In the absence of specially constructed shelters:

Utilize a foxhole, a dugout, or on the lowest floor
or basement of a reinforced concrete or steel-framed building
The safest place is in the basement near walls.
The next best place is on the lowest floor in an interior room, passageway, or hall, away from the
windows and, if possible, near a supporting

Radiological warfare

- In the event of a surprise attack, drop to a prone position in a doorway or against a bulkhead or wall

Radiological warfare

- Only personnel who have had training and experience as members of Radiological
- Safety/Decontamination teams or as members of Damage Control parties should be assigned to the monitoring station.

Biological warfare

- Cotton swabs or gauze may be used to decontaminate moist areas
- Use gummed tapes to decontaminate dry areas

Radiological warfare

- After the first cleansing, and decontamination is inadequate, the process should be repeated three to five times
- If contamination persists,
- a preparation consisting of a mixture of 50 percent detergent and 50 percent cornmeal, with enough water added to make a paste, should be tried.
- The contaminated area should be scrubbed (preferably with a soft-bristle surgical brush)for 5 minutes, then rinsed